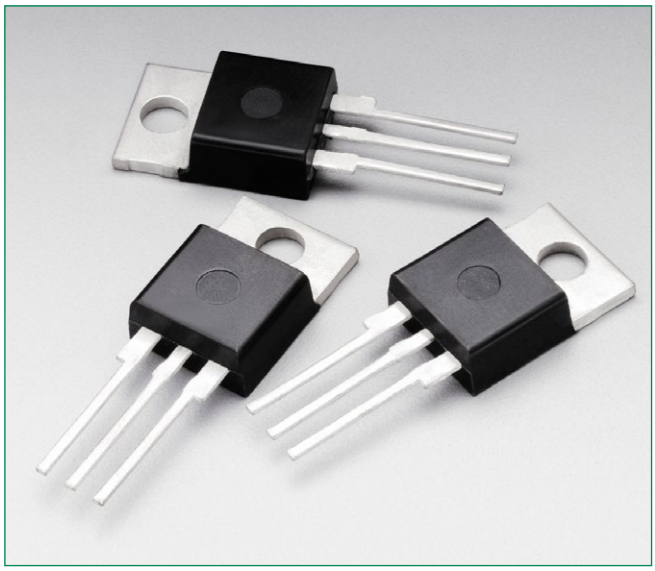
MAC228A



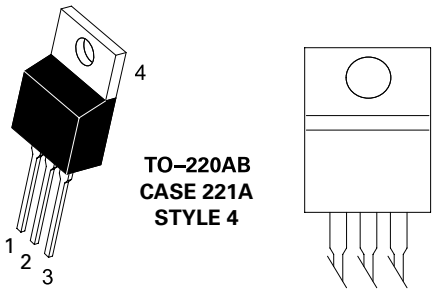
Description

Designed primarily for industrial and consumer applications for full–wave control of AC loads such as appliance controls, heater controls, motor controls, and other power switching applications.

Features

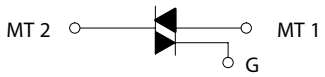
- Sensitive Gate Triggering in 3 Modes for AC Triggering on Sinking Current Sources
- Four Mode Triggering for Drive Circuits that Source Current
- All Diffused and Glass–Passivated Junctions for Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance and High Heat Dissipation
- Center Gate Geometry for Uniform Current Spreading
- These Devices are Pb–Free and are RoHS Compliant

Pin Out



TO–220AB
CASE 221A
STYLE 4

Functional Diagram



Additional Information

Datasheet | **Resources** | **Samples**

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Maximum Ratings (T_J = 25°C unless otherwise noted)

Rating		Symbol	Value	Unit
Peak Repetitive Off–State Voltage (Note 1) (– 40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open)	MAC228A4 MAC228A6 MAC228A8 MAC228A10	V_{DRM}, V_{RRM}	200 400 600 800	V
On-State RMS Current (T_C = 80°C) Full Cycle Sine Wave, 50 to 60 Hz		$I_{T\ (RMS)}$	8.0	A
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, TJ = 110°C)		I_{TSM}	80	A
Circuit Fusing Consideration (t = 8.3 ms)		I^2t	26	A^2sec
Peak Gate Current, (t ≤ 2 s, T_C = 80°C)		I_{GM}	±2.0	A
Peak Gate Voltage, (t ≤ 2 s, TC = 80°C)		V_{GM}	±10	V
Peak Gate Power (t ≤ 2 µs, T_C = 80°C)		P_{GM}	20	W
Average Gate Power (t ≤ 8.3 ms, T_C = 80°C)		$P_{G\ (AV)}$	0.5	W
Operating Junction Temperature Range		T_J	-40 to +125	°C
Storage Temperature Range		T_{stg}	-40 to +150	°C
Mounting Torque		–	8.0	in lb

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

Thermal Characteristics

Rating		Symbol	Value	Unit
Thermal Resistance,	Junction–to–Case (AC) Junction–to–Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.0 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds		T_L	260	°C

Electrical Characteristics - OFF (T_J = 25°C unless otherwise noted ; Electricals apply in both directions)

Characteristic		Symbol	Min	Typ	Max	Unit
Peak Repetitive Blocking Current (V_D = V_{DRM} = V_{RRM}; Gate Open)	T_J = 25°C	I_{DRM}, I_{RRM}	-	-	1.0	mA
	T_J = 125°C		-	-	2.0	

Electrical Characteristics - ON (T_J = 25°C unless otherwise noted; Electricals apply in both directions)

Characteristic		Symbol	Min	Typ	Max	Unit
Peak On–State Voltage (I_{TM} = ±11 A Peak, Pulse Width ≤2 ms, Duty Cycle ≤2%)		V_{TM}	–	–	1.8	V
Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 100 Ohms)	MT2(+), G(+)	I_{GT}	–	–	5.0	mA
	MT2(+), G(–)		–	–	5.0	
	MT2(–), G(–)		–	–	5.0	
	MT2(–), G(+)		–	–	10	
Gate Trigger Voltage (Continuous dc) (V_D = 12 V, R_L = 100 Ω)	MT2(+), G(+)	V_{GT}	–	–	2.0	V
	MT2(+), G(–)		–	–	2.0	
	MT2(–), G(–)		–	–	2.0	
	MT2(–), G(+)		–	–	2.5	
Gate Non–Trigger Voltage (Continuous DC), (V_D = 12 V, T_C = 110°C, R_L = 100 Ω) All Four Quadrants		V_{GD}	0.2	–	–	V
Holding Current (V_D = 12 V_{dc}, Gate Open, Initiating Current = ±200 mA))		I_H	–	–	15	mA
Gate–Controlled Turn–On Time, (V_D = Rated V_{DRM}, I_{TM} = 16 A Peak, I_G = 30 mA)		t_{gt}	–	1.5	–	µs

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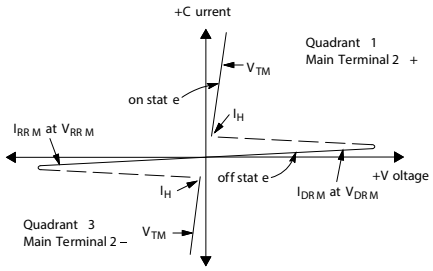
Dynamic Characteristics

Characteristic	Symbol	Min	Typ	Max	Unit
Critical Rate of Rise of Commutation Voltage (V_D = Rated V_{DRM}, I_{TM} = 11.3 A, Commutating di/dt = 4.1 A/ms, Gate Unenergized, T_C = 80°C)	(di/dt)c	–	5.0	–	A/ms
Critical Rate of Rise of Off-State Voltage (V_D = Rated V_{DRM}, Exponential Waveform, Gate Open, T_C = 110°C)	dv/dt	–	25	–	V/µs

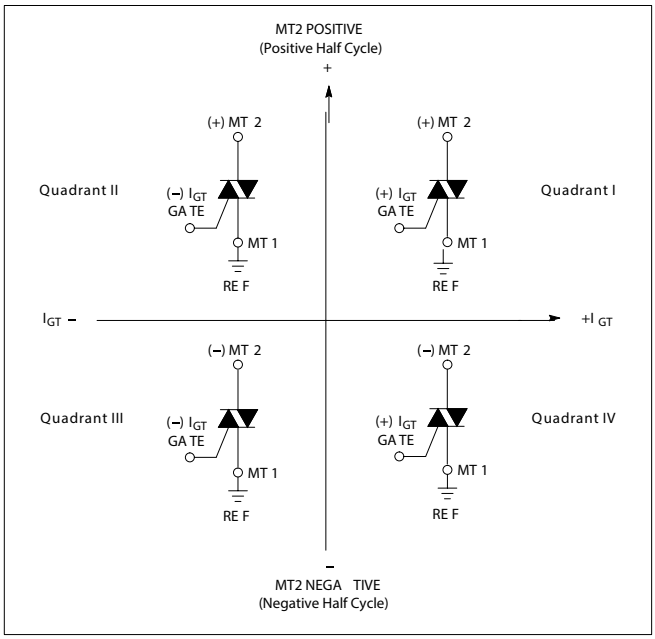
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Voltage Current Characteristic of SCR

Symbol	Parameter
V_{DRM}	Peak Repetitive Forward Off State Voltage
I_{DRM}	Peak Forward Blocking Current
V_{RRM}	Peak Repetitive Reverse Off State Voltage
I_{RRM}	Peak Reverse Blocking Current
V_{TM}	Maximum On State Voltage
I_H	Holding Current



Quadrant Definitions for a Triac



All polarities are referenced to MT1.
With in–phase signals (using standard AC lines) quadrants I and III are used

Figure 1. Current Derating

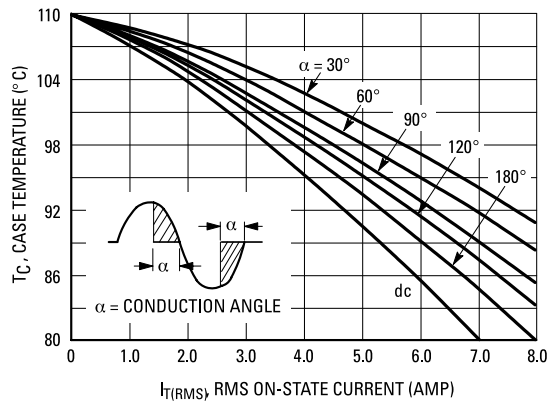
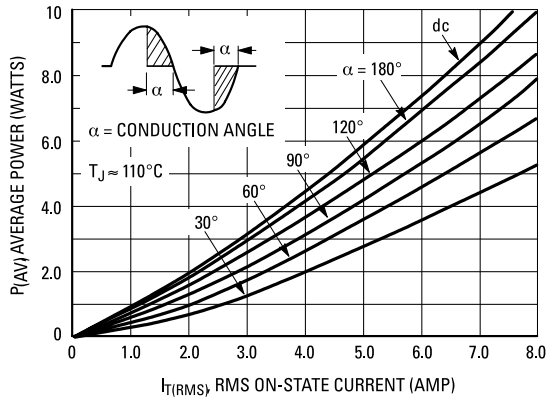


Figure 2. On–State Power Dissipation



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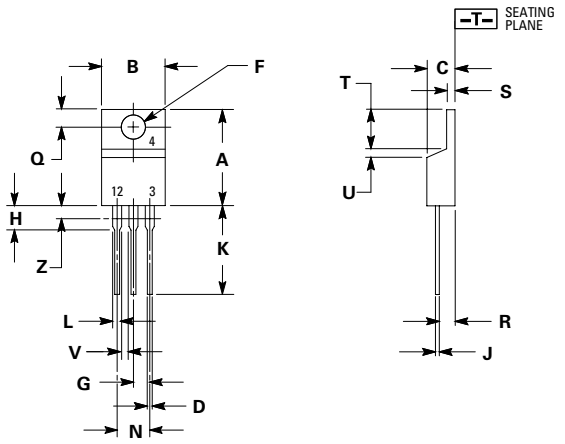
Thyristors

Surface Mount – 400V - 800V > MAC228A

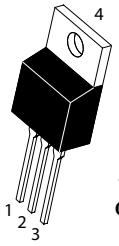
Dimensions



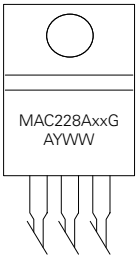
Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	0.590	0.620	14.99	15.75
B	0.380	0.420	9.65	10.67
C	0.178	0.188	4.52	4.78
D	0.025	0.035	0.64	0.89
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.41	2.67
H	0.110	0.130	2.79	3.30
J	0.018	0.024	0.46	0.61
K	0.540	0.575	13.72	14.61
L	0.060	0.075	1.52	1.91
N	0.195	0.205	4.95	5.21
Q	0.105	0.115	2.67	2.92
R	0.085	0.095	2.16	2.41
S	0.045	0.060	1.14	1.52
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

Part Marking System



TO–220AB
CASE 221A
STYLE 12



xx = 4, 6, 8, or 10
A= Assembly Location (Optional)*
Y= Year
WW = Work Week
G = Pb–Free Package

Pin Assignment	
1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	No Connection

Ordering Information

Device	Package	Shipping
MAC228A4G	TO-220AB (Pb-Free)	500 Units/ Box
MAC228A6G		500 Units/ Box
MAC228A6TG		500 Units/ Box
MAC228A8G		500 Units/ Box
MAC228A8TG		500 Units/ Box
MAC228A10G		500 Units/ Box

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